



# NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

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## MBA PROFESSIONAL REPORT

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**Should the Department of Defense Hedge Oil Prices In Order To Save  
Money?**

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**By: James W. Knapp  
March 2008**

**Advisors: Bryan Hudgens,  
Nicholas Dew**

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**SHOULD THE DEPARTMENT OF DEFENSE HEDGE OIL PRICES IN ORDER  
TO SAVE MONEY?**

James W. Knapp, Captain, United States Air Force

Submitted in partial fulfillment of the requirements for the degree of

**MASTER OF BUSINESS ADMINISTRATION**

from the

**NAVAL POSTGRADUATE SCHOOL  
March 2008**

Authors:

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James W. Knapp

Approved by:

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Lt. Col Bryan Hudgens, USAF

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Professor Nicholas Dew

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Robert N. Beck, Dean  
Graduate School of Business and Public Policy

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# **SHOULD THE DEPARTMENT OF DEFENSE HEDGE OIL PRICES IN ORDER TO SAVE MONEY?**

## **ABSTRACT**

**Objective:** This paper explores one possible solution to the DoD problem of increased expenditures due to rises in the costs of jet fuel. This paper provides a brief overview of the futures market and of commercially accepted practices utilized by the airlines within the futures market. The goal of this paper is to explore the feasibility of the government entering the futures market in order to reduce the current DoD jet fuel cost and whether the potential savings would outweigh the associated risks and costs. This paper briefly discusses the current method of procurement and examines the commercial practices of futures trading, focusing on the airline industry which offers the greatest affinity to the DoD.

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## **I. RESEARCH QUESTIONS**

To address this overall objective, several research questions were developed.

1. Should the DoD enter into the futures market and hedge oil prices?
2. Is there a budgetary need for the DoD to make this move in light of current DoD spending?
3. Are there other options?
4. What are the benefits and drawbacks if the DoD enters the futures market?
5. What would be the obstacles to DoD's entry into the market?
6. Is entering the futures market politically feasible?
7. How would DoD's entrance influence the futures market?
8. How would the DoD accomplish its entrance in to the futures market? (organic vs. contracted out)

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## **II. PROBLEM IDENTIFICATION**

**Chapter Overview:** The purpose of this chapter is to explain current government procurement of fuel, convey the amount of fuel that the DoD uses and the cost of that fuel, explain some of the budget impacts that the DoD fuel costs have to the U.S. government and finally, to explain how increases in fuel costs have affected readiness in the DoD.

### **A. HOW THE DOD PROCURES FUEL**

The DoD is the largest single consumer of fuel in the United States, purchasing 1.8% of America's total transportation fuel requirements.<sup>1</sup> The DoD procures fuel at current market prices through the Defense Energy Support Center (DESC), using the Defense Working Capital Fund (DWCF). The working capital fund is replenished by operations.<sup>2</sup> The DWCF outlays the initial funding to purchase fuel and as operations occur individual command funds reimburse the DFWC. This way an individual squadron commander can keep tight reigns on his or her budget but the DFWC can ensure that the fuel is purchased. Also the DWCF can continue to run without the interruption of the end of the fiscal year.<sup>3</sup>

The amount of money that the DWCF receives each year is determined by the Office of Management and Budget (OMB) projections. The end goal of the DFWC fund is to break even so that the amount of money that it outlays is replenished by operational commands. The problem is that the OMB has been grossly inaccurate with its forecasts and Congress has had to appropriate additional funding to the DWCF.<sup>4</sup>

### **B. CURRENT DOD FUEL USAGE**

The United States government is the world's largest single fuel burning entity. The DoD consumes 440,000 barrels of oil per day or 160 million barrels of oil per year;

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<sup>1</sup> Lawrence E. Spinetta "War Without Oil: Catalyst for Transformation Fuel Hedging: Lessons from the Airlines." Air Force Journal of Logistics XXX3(2006): 32-45.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Ibid.

at 2007 prices that equates to over \$14 billion dollars.<sup>5</sup> According to the DESC<sup>6</sup>, the service breakdown for fuel is:\*

Department of the Air Force: 53%

Department of the Navy (including Marine Corps): 32%

Department of the Army: 12%

The DESC fact book also states that in FY05 the Army, Navy and Marines spent a combined \$8 billion on petroleum and the U.S. Air Force spent \$6.2 billion.<sup>7</sup> U.S. military forces stationed in Iraq on average consume nine gallons of fuel for every soldier, sailor, airman and marine.<sup>8</sup>

A great demand has been put on the world's fossil fuel resources. Both the Global War on Terror (GWOT) and military operations in Iraq and Afghanistan have forced the DoD to use more fuel. Mobility airlift, battle group deployment and tactical fighting all require fossil fuel to carry out their missions; it is fundamental in how the DoD accomplishes its mission. Additionally the infrastructures of the military services are comprised of older aircraft and ships. These items are not all utilizing the latest technology in energy-efficient propulsion. Finally, due to recent world events, including the industrial revolution in China and other so-called Tiger nations, world wide energy consumption has grown exponentially.<sup>9</sup> The demand for oil is outstripping the supply of the valuable resource.<sup>10</sup>

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<sup>5</sup> Sohbet Karbuz. (2006, July, 13). Pentagon and Peak Oil: A Military Literature Review. *Energy Bulletin*, 342, Retrieved March 3, 2007, from <http://www.energybulletin.net>

<sup>6</sup> Ibid.

\* Other government entities are included in the breakdown but not listed

<sup>7</sup> Ibid.

<sup>8</sup> Ibid.

<sup>9</sup> Dave Carter, Dan Rogers, and Betty Simkins. "Fuel Hedging in the Airline Industry."

<sup>10</sup> Kevin Cheng, .Mercer-Blackman "High Oil Prices Challenge Policymakers." *IMF Survey Magazine: IMF Research* 11200720 NOV 2007 1-7. 1 DEC 2007  
<<http://www.imf.org/external/pubs/ft/survey/so/2007/RES1120A.htm>>.

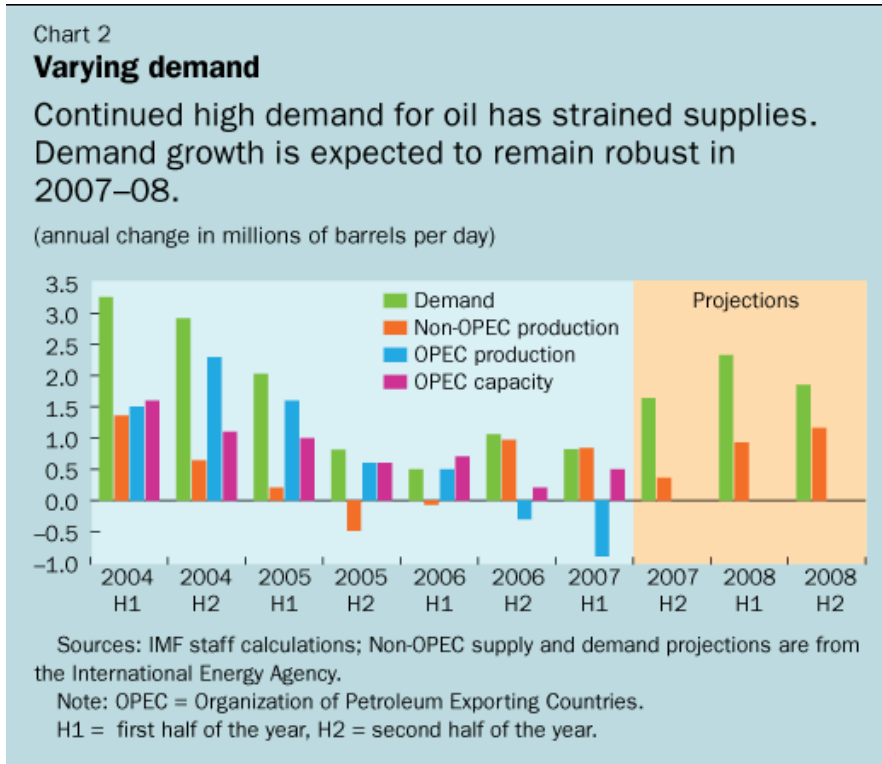


Figure 1. Varying Demand. (From: Cheng, Kevin .Mercer-Blackman "High Oil Prices Challenge Policymakers." IMF Survey Magazine: IMF Research

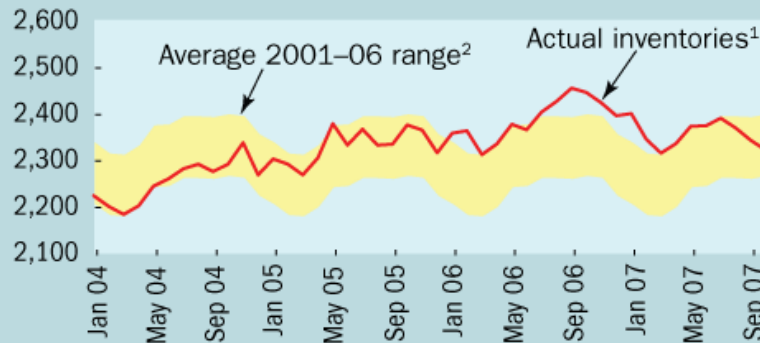
As seen above the demand for oil has become greater but the evidence below suggests that the supply of oil is dwindling.

Chart 3

### Reversing the trend

Inventories of oil in OECD countries have been declining during a period normally characterized by a build-up.

(million barrels)



Sources: International Energy Agency; and IMF staff estimates.

Note: OECD = Organization for Economic Cooperation and Development.

<sup>1</sup>Average price of West Texas, Brent, and Dubai crude.

<sup>2</sup>Average of each calendar month during 2001-06, with a 40 percent confidence interval based on past deviations.

Figure 2. Reversing the Trend (From Cheng, Kevin .Mercer-Blackman "High Oil Prices Challenge Policymakers." IMF Survey Magazine: IMF Research

Given the increased demands and corresponding lower supply, various industries have been forced to adapt to fluctuating prices. The commercial aviation industry has utilized hedging strategies to lessen their exposure to these fluctuations in the price of jet fuel.<sup>11</sup> The DoD, however, does not utilize this strategy and procures fuel at the spot price.

<sup>11</sup> Kevin Cheng, Mercer-Blackman "High Oil Prices Challenge Policymakers." IMF Survey Magazine: IMF Research 11200720 NOV 2007 1-7. 1 DEC 2007  
<<http://www.imf.org/external/pubs/ft/survey/so/2007/RES1120A.htm>>.



### C. BUDGET IMPACTS

In 2006 the DoD fossil fuel budget was approximately 2.5-3% of the total national-defense budget.<sup>12</sup> The most recent supplement to the federal budget included a request from the Air Force to account for increases in fuel cost for the fiscal year.<sup>13</sup> Additionally Congress contributes to working capital accounts in order to compensate for rising fuel costs. Since September 11<sup>th</sup>, the amount of money requested for fuel by the services has doubled.<sup>14</sup> Every ten-dollar per barrel increase in the price of oil costs the U.S. Air Force approximately \$850M per year.<sup>15</sup> United States military forces in Iraq use about 1.7 million gallons of fuel a day.<sup>16</sup>

Despite this increase, DoD fuel costs are not the largest issue facing the budget in the coming years. The DoD consumption of fuel is less than 2% of the total U.S. domestic consumption of oil.<sup>17</sup> Therefore the DoD cannot drive prices up or down as a fuel consumer. Yet fuel costs have become increasingly noticeable as a budget item because fuel costs represent a large amount of the life-cycle costs of mobility aircraft and non-nuclear ships.<sup>18</sup>

Fuel use also affects the budget in other ways. The U.S. needs to keep firm relations with oil producing countries in order to maintain the supply of fuel needed to move the DoD. Therefore the DoD fuel use is subject to many cost drivers and political regulations that hamper the services from optimizing fuel use. Being able to hedge fuel costs would aid in the DoD capability to utilize fuel and budget for future activities.

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<sup>12</sup> The Department of Defense Green Procurement Strategy. (12 March 2006). Retrieved March 19, 2007, from <http://www.ofee.gov/gp/gppstrat.pdf>

<sup>13</sup> FY06 Budget Priorities: Department of Defense." [www.whitehouse.gov](http://www.whitehouse.gov). 23 Sept 2007. United States Office of Management and Budget. 26 Sep 2007  
<<http://www.whitehouse.gov/omb/budget/fy2006/defense.html>>.

<sup>14</sup> Sohbey Karbuz. (2006, July, 13). Pentagon and Peak Oil: A Military Literature Review. *Energy Bulletin*, 342, Retrieved March 3, 2007, from <http://www.energybulletin.net>

<sup>15</sup> Lawrence E. Spinetta . "War Without Oil: Catalyst for Transformation Fuel Hedging: Lessons from the Airlines." *Air Force Journal of Logistics* XXX3(2006): 32-45.

<sup>16</sup> Ibid.

<sup>17</sup> Ibid.

<sup>18</sup> Air Force Studies Board, (2006). *A Review of the United States Air Force and Department of Defense Aerospace and Propulsion Needs*. Washington D.C.: The National Academies Press.

Hedging is a proven, efficient business practice. It can aid in anticipating fuel costs and provide beneficial strategies that enable the DoD to plan, budget and execute a fuel resource procurement strategy. This would be in direct opposition to how fuel is procured currently. Decision makers could allocate the correct budget based on a stabilized price. The end goal would be that the budgeted amount for DoD fuel would be commensurate with the amount and cost of fuel that the DoD needs to conduct operations.

Stabilized prices and predictable cycles would also lessen the taxpayers' burden. Reducing the taxpayer burden was one of the desired outcomes of the Defense Transformation Act (DTA).<sup>19</sup> The DTA was initiated to address serious problems in regards to DoD expenditures.<sup>20</sup> Fuel procurement and management is one such serious problem because the amount and cost of fuel has risen in recent years. Fuel efficiency must be part of the objective criteria for all applicable acquisition decisions in order to meet the flexibility mandated by the DTA. The DoD may have to look towards alternative fuels that are cheaper and or more readily available so that overall fuel efficient is increased. Hedging has the ability to improve cash-flow management because it helps to ensure that the funds are available to meet the objectives of the DoD. In theory hedging could make the need to seek supplemental funding obsolete.

#### **D. READINESS IMPACTS**

The FY06 fuel budget for the Air Force was \$800M greater than the fuel budget for FY05 and after the FY06 budget was submitted the Air Force had another shortfall of \$800M.<sup>21</sup> These budgetary shortfalls had wide-ranging consequences.

In FY05 in order to deal with shortfalls the Air Force made unilateral cuts across all programs. In FY06 the Air Force already had \$3.7B in unfunded requirements.<sup>22</sup> Unfunded requirements are programs that are needed by operational commands but have

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<sup>19</sup> Jerry L. McCaffery, and L.R. Jones. Budgeting and Financial Management for National Defense. 1st. Greenwich C.T.: Information Age Publishing McCaffery and Jones, 2004.

<sup>20</sup> Ibid.

<sup>21</sup> Lawrence E. Spinetta. "War Without Oil: Catalyst for Transformation Fuel Hedging: Lessons from the Airlines." Air Force Journal of Logistics XXX3(2006): 32-45.

<sup>22</sup> Ibid.

yet to be funded due to budget constraints. In order to pay for the exacerbated fuel bill, \$1.1B in new Air Force funding was allocated from non-fuel programs.<sup>23</sup> Along with preventing the funding of other requirements, the budget shortfalls also affected existing programs. Money allocated from the Airborne Laser Lab program in order to pay for the current year fuel bill resulted in a schedule slip. The Joint Strike Fighter may also slip in schedule because its engine funding line was tapped for a \$100M reduction.<sup>24</sup>

It is not only future programs that are suffering from the run on fuel. Air Combat Command (ACC) has reduced its flying hours in order to fit within the budget constraints.<sup>25</sup> The impact on a reduction of flying hours is readiness; pilots will not have enough training sorties to be considered fully mission qualified. Analysis has shown that the amount of flying hours will have to be reduced by ten percent each year from FY08 to FY13 in order to accommodate the increased fuel bill.<sup>26</sup>

#### **E. SUMMARY**

The DoD procures fuel at the spot price. In recent years the demand for oil has increased; additionally the U.S. is at war so the DoD's total fuel consumption has increased even more. The increased demand has driven up the price for fuel. This has had a negative effect on the budget of the DoD and hurt readiness in the military. Hedging fuel cost may prove to be a viable solution to several of these problems.

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<sup>23</sup> Lawrence E. Spinetta. "War Without Oil: Catalyst for Transformation Fuel Hedging: Lessons from the Airlines." Air Force Journal of Logistics XXX3(2006): 32-45.

<sup>24</sup> Ibid.

<sup>25</sup> Wicke, "Rising Fuel Costs Tighten Air Force Belt," *Air Force Link*, 9 Sep 2006.

<sup>26</sup> Lawrence E. Spinetta. "War Without Oil: Catalyst for Transformation Fuel Hedging: Lessons from the Airlines." Air Force Journal of Logistics XXX3(2006): 32-45.

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### III. EXPLANATION OF FUTURES

**Chapter Overview:** In today's world commodity prices can increase and decrease at rapid rates. For those organizations that use commodities in the course of doing business the commodity price fluctuations increase risk exposure. Businesses do not know the future price of commodities and can not forecast expenses with sufficient accuracy to ensure that a profit is realized. This uncertainty exposes business to risk. The financial derivatives markets helps businesses mitigate the amount of risk to which they are exposed. The purpose of this chapter is to explain financial derivatives and to describe the financial derivative tools that make hedging possible.

#### A. FINANCIAL DERIVATIVES

A financial derivative is a financial instrument that gets its value from the price of an underlying asset.<sup>27</sup> In most cases an asset is traded at the spot price on the open market. This allows for the sale and purchase of an asset to occur in real time. The financial derivative is a financial contract that has a value which is derived from the value of the underlying asset. The underlying asset can be a stock, a commodity, equity, currency, a bond or a number of other things.<sup>28</sup>

Financial derivatives enable people to exchange risk on the open market place. To better explain derivatives we will use a farmer as an example. Farmers utilize financial derivatives to mitigate risk. Farmers can utilize a derivative to sell their crops before the harvest at a specified price. By doing so a farmer has locked in a certain amount of profits because no matter what the price of the crop at harvest time the Farmer has already sold his future crop at a specified price. In this case the underlying asset is the crop and the farmer is mitigating his risk by entering the derivative market. While this example focused on a comparatively smaller business (a farmer), large firms such as McDonalds can utilize the derivative market for risk mitigation also.

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<sup>27</sup> George Kleinman. Trading Commodities and Financial Futures: A step by step Guide to Mastering the Market. 3rd. New York: Financial Times Prentice Hall, 2005.

<sup>28</sup> Ibid.

Some organizations purchase commodities at set prices to lock in costs that they will have to outlay over future periods. However, speculators also utilize the financial derivatives market to realize gains. A speculator can make a profit by utilizing an arbitrage strategy in which he exploits a weakness in the price of a contract. A common arbitrage strategy would occur when a commodity sells for \$5 on one market but \$6 on another market. A person who deals in risk arbitrage could exploit this discontinuity by buying on one market and selling for a profit on another market. The speculator in the derivatives market can garner great returns—at the risk of potentially great losses—because the derivatives market allows speculators to buy and sell contracts with little or no money at the time of the sale. This is because the buyer is not purchasing the entire underlying asset. This capability is referred to as leverage.<sup>29</sup> For the speculators the risk of the derivatives market is much higher than owning the security outright and the return is also greater. Hence the derivatives market allows for the brokering of risk between firms, brokers, hedgers and speculators. Each party can trade risk to mitigate exposure in their own portfolios of assets. The next section describes common financial instruments on the derivative market: forward contracts, futures contracts, swaps and options.

## **B. FORWARD CONTRACT**

A forward contract is a basic derivative contract that specifies the price of an asset at a future date or not on the spot market.<sup>30</sup> The futures contract allows for the purchase or the sale of the asset at the date specified. The forward price is the price set for the asset on the specified date. Therefore the value of the forward contract is very similar to the value of a stock because it is based on a perceived value of a tangible asset. The price reflects the current consensus of what the asset will be worth in the future. In order to purchase a forward contract the buyer does not have to put money down at the time of the sale but agrees to buy the asset at a set date in the future.

## **C. FUTURES CONTRACT**

Futures contracts are very similar to forward contract but futures contracts require the buyer of the contract to pay some percentage of the sales price, or a margin, when

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<sup>29</sup> George Kleinman. Trading Commodities and Financial Futures: A step by step Guide to Mastering the Market. 3rd. New York: Financial Times Prentice Hall, 2005.

<sup>30</sup> Ibid.

purchasing the contract. Futures are also traded on exchanges, unlike forward contracts, and are therefore more heavily government regulated. Futures contracts also specify the quantity, quality and date that the commodity should be received. The standardization of the futures contract is done so that trade of the contracts can occur.

Futures contracts are transferable but they do require that the holder of the contract on the buy date must buy the underlying asset. That said, the contractually-required physical delivery of the commodity rarely actually occurs; most contracts are settled without physical transference of the underlying asset.<sup>31</sup> The risk associated with the buyer and the seller of futures contracts is almost unlimited because the price of a particular item does not have a ceiling. In the end futures contracts are a zero sum game.<sup>32</sup> There are winners and there are losers when dealing with futures contracts.

The cost-of-carry model is used to price futures contracts.<sup>33</sup> The cost-of-carry model is designed to neutralize the difference between the assets being purchased at the spot price or the future price because the cost of carrying the asset or the cost of owning the asset for a certain period of time is built into the price. The futures price equals the spot price plus the carry cost minus carry return. The carry return is the dividend gained by holding the asset until the end of the contract.

Arbitrage occurs when the cost of carry model yields an unequal favoritism to the spot price or the futures price. Cash and carry arbitrage occurs when the futures price is greater than the spot price plus the carrying cost minus the carry return. Reverse cash and carry occurs when the spot price plus the carrying cost less the carry return is greater than the futures price.

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<sup>31</sup> Who Loses When Airlines Win." Ask Meta Filter. 2007. 5 Sep 2007  
<<http://ask.metafilter.com/37145/who-loses-when-airlines-win>>.

<sup>32</sup> George Kleinman. Trading Commodities and Financial Futures: A step by step Guide to Mastering the Market. 3rd. New York: Financial Times Prentice Hall, 2005.

<sup>33</sup> Helyette German. Commodities and Commodity Derivatives : Modeling and Pricing for Agricultures, Metals and Energy. 1st. West Sussex England: John Wiley and Sons, 2005.

#### **D. SWAPS**

In order to mitigate risk from exposure to interest rates many firms utilize swaps.<sup>34</sup> Organizations borrowing large sums of money from lenders are affected negatively by rising interest rates. Increased interest rates make it harder for some organizations to make a profit. So in order to mitigate the risk associated with fluctuating interest rates organizations can utilize swaps. Swaps are agreements to trade a series of cash flows over a specified period of time in the future. A simple example of a swap is a currency swap between two different companies. USA corporation, based in the U.S. wants to gain financing in euros to reduce its exposure generated by exports to the United Kingdom and U.K corporation, based in the U.K, wants to gain financing in U.S. dollars in order to mitigate exposed risk generated by sales in the United States. Both companies could take out fixed rate loans in their respective domestic currency for equal exchange level amounts and then swap the fixed rate payments. Such a swap would allow for each company to mitigate their risk exposure that was generated during the course of business. Swaps are utilized because they are considered very liquid instruments. There are many different permutations to swaps trades. Swap trades can exchange fixed rate returns for floating rate returns and or exchange cash flows in different currencies.

#### **E. OPTIONS**

Options are broken into two different categories: calls and puts. A call option gives a buyer the right to purchase something at a specified strike price. Buying a put option gives the right to sell the underlying asset, normally a stock, at a specified strike price. The options are tied to a specific date referred to as the exercise date.<sup>35</sup> Buyers and sellers can exercise their options up until the exercise date after which time the option has expired. Put options are used to mitigate the risk of an asset value falling below a certain threshold. If the value of the asset is declining the owner of a put option can sell the asset to control his losses. In this technique a put option creates an artificial floor value that can help him mitigate his risk. A call option works in the other direction, a speculator can

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<sup>34</sup> George Kleinman. Trading Commodities and Financial Futures: A step by step Guide to Mastering the Market. 3rd. New York: Financial Times Prentice Hall, 2005.

<sup>35</sup> Ibid.



purchase the option to procure an underlying asset at a specified price at a future date and if the asset is worth more than the call price the speculator has made a profit.

## **F. MARKETS**

Derivatives can also be divided into how they are traded. A derivative contract can be traded Over-the-Counter (OTC) or in a specialized market called an exchange. An OTC contract is conducted between two parties without the use of a mediator. Swaps, forward rate agreements and specialized options are common instruments that are traded via the OTC market. The contracts are governed by the International Swaps and Derivatives Association (ISDA).<sup>36</sup> Derivatives traded in exchanges are referred to as Exchange-traded derivatives. Exchanges are located throughout the world but some of the larger exchanges are in: Korea (KOSPI Index Futures and Options), the European Union (EUREX Index and interest rate products), and Chicago (the Chicago Mercantile Exchange (CME) and the Chicago Board of Trade (CBOT)). The exchange acts as a marketplace where derivative contracts are traded. The exchange takes a margin from the buyer and seller on each side of the trade to cover transaction costs and act as a fee on the contract.<sup>37</sup>

## **G. ENERGY DERIVATIVE**

Energy commodities such as oil, gas and power contracts are traded at a few different exchanges, specifically the New York's Mercantile Exchange (NYMEX) and Tokyo's Commodity Exchange (TOCOM), through a computerized network on the Intercontinental Exchange. The purposes of the energy trade are for risk mitigation, speculation and for portfolio diversification.<sup>38</sup> Trading in the energy derivatives does not, however, always mitigate risks. China Aviation Oil (CAO) reported losses in December of 2004 that exceeded \$550M due to CAO's inexperience and ungoverned trading in energy derivatives.<sup>39</sup> The United States has taken measures to counteract the inherent risk in the energy trade by establishing regulatory agencies to oversee the trade of energy. The

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<sup>36</sup> George Kleinman. Trading Commodities and Financial Futures: A step by step Guide to Mastering the Market. 3rd. New York: Financial Times Prentice Hall, 2005.

<sup>37</sup> Ibid.

<sup>38</sup> Ibid.

<sup>39</sup> Takahashi, Kosuke. "Jet Fuel Scandal Deals China a Body Blow." Asia Times 07 Dec 2004 : 32.

Commodity Futures Trading Commission serves as guard against fraud and manipulation of the energy trade market.<sup>40</sup> The Federal Energy Regulatory Commission also oversees the energy derivative market to investigate volume of trades and to see the impact of derivative trading on the underlying commodities price.<sup>41</sup>

## **H. SUMMARY**

Derivatives are financial instruments that are hinged upon an underlying asset. Futures contracts, forward contracts, swaps and options are all different types of derivatives. The derivatives market and more specifically the futures market is utilized by businesses, speculators and hedgers to reallocate risk. Derivatives can be traded at an exchange or through various markets. Derivatives trading and especially energy trading occurs world wide but laws and government agencies do exist that monitor and serve as a safeguard in the derivatives market. The derivatives market allows for purchasers and sellers of contracts to utilize leverage in the marketplace. The use of leverage can yield greater gains and losses than outright ownership of a stock, bond or commodity.

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<sup>40</sup> Krupka, Catherine and Athena Velie. "There's a New Sheriff in Town: Energy Derivatives and FERC." Futures Industry Magazine 01 AUG 2007 12-18. 02 SEPT 2007.

<sup>41</sup> Ibid.

## IV. COMMERCIAL PRACTICES IN JET FUEL HEDGING

**Chapter Overview:** The purpose of this chapter is to examine the strategic visions of differing airlines in regards to fuel hedging. We will examine the methods that airlines use to hedge fuel costs. We will look at the technological influences on the airline industry and how the industry might change in the future.

### A COMPETITIVE LANDSCAPE

Airline price/earnings ratios are on an average half to a third of the market average.<sup>42</sup> Since the deregulation of the Airlines in 1978, airline profitability and survival has been directly linked to an organization's ability to control costs.<sup>43</sup> In the airline industry the most expensive operating cost is labor; fuel costs are the second biggest operating expense, representing a 30% operating cost for the airline industry.<sup>44</sup> For every \$1.00 increase in price per gallon, the airlines collectively pay \$425M in additional operating costs.<sup>45</sup>

The International Air Transport Association (IATA) has 261 organizational members that represent 94% of the worlds scheduled air traffic providers.<sup>46</sup> IATA world wide airline losses reached over \$3B in 2006 and IATA reported that the airlines as a whole have not been profitable since 2000.<sup>47</sup> IATA stated that the terrorist attacks of 2001, Severe Acute Respiratory Syndrome (SARS), and excess capacity—but mostly increased fuel prices—have been cited as causes for unprofitable returns in the airline industry.<sup>48</sup>

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<sup>42</sup> "BA's fuel surcharge to increase." BBC News BBC.CO.UK08 Oct 2004 21 Sept 2007 <<http://news.bbc.co.uk/1/hi/business/3726424.stm>>.

<sup>43</sup> Dave Carter, Dan Rogers, and Betty Simkins. "Fuel Hedging in the Airline Industry."

<sup>44</sup> Amanda Cantrell (2006, April, 26). The Blame Game: Hedge Funds & Oil. *CNN Money.com*, 52006, Retrieved March 16, 2007, from <http://cnmmonet.com>

<sup>45</sup> Lawrence E. Spinetta. "War Without Oil: Catalyst for Transformation Fuel Hedging: Lessons from the Airlines." Air Force Journal of Logistics XXX3(2006): 32-45.

<sup>46</sup> "Airline Group Raises its 2006 Loss Forecast." International Herald Tribune 05 Jun 2006:

<sup>47</sup> Ibid.

<sup>48</sup> "Airline Group Raises its 2006 Loss Forecast." International Herald Tribune 05 Jun 2006:

Air travel and airfreight is a very competitive industry. It is extremely hard for airlines to pass increased fuel cost down to the customer because consumers of airline tickets and airfreight have different carriers to choose from and have low switching costs. Continental Airlines found that they could not raise fares without suffering a major loss in passenger traffic and rescinded a fare hike that was in response to higher fuel prices.<sup>49</sup>

However, different airlines have different exposure to the volatility of the jet fuel market. American Airlines (AA) has a larger capacity than Continental Airlines and alters AA ticket prices on a daily basis. Hence AA can adjust its prices to absorb some of the risk that goes with floating fuel prices. On the other hand Southwest Airlines promotes steady prices and can not afford to expose itself to as much risk in the movement of fuel prices.

The airlines utilize fuel hedging as a risk management tool to bracket operating costs. They also utilize the hedging strategy to create a stable predictable cash flow to avoid distress in their stock price. Hedging also stabilizes volatility of cash flow and helps to make costs more predictable thus aiding the management process. Hedging creates value through effective trading; hence, to a point, the more it is done the better off the airline is due to learning curve benefit.

Southwest has been the only major U.S. airline to remain profitable since September 11 2001.<sup>50</sup> Southwest is also one of the most aggressive fuel hedgers of all the airlines. Southwest was able to cap eighty six percent of its fuel needs for 2006 at a price of \$28 per barrel compared to an industry average of \$56 per barrel.<sup>51</sup> Southwest's aggressive hedging strategy helps the airline when the price of oil continues to climb. If there is a sharp decline in the price of oil in the future Southwest will be forced into a competitive disadvantage in the airline industry.

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<sup>49</sup> Bansal, Paritosh. "2-Airlines rescind last week's fare increase." Reuters 30 Oct 2006 10 Sept 2007 <<http://www.reuters.com/article/company>>.

<sup>50</sup> Mary Schlangenhein, "Southwest Profits Jump" *The Washington Post*, 15 Apr 2007

<sup>51</sup> Lawrence E. Spinetta "War Without Oil: Catalyst for Transformation Fuel Hedging: Lessons from the Airlines." Air Force Journal of Logistics XXX3(2006): 32-45.

## **B. AIRLINES THAT HEDGE VERSUS THOSE THAT DO NOT**

A downturn in the price of oil is the central argument for airlines not to hedge against fuel costs. Airlines could be wrong in their estimation of the price of oil. The oil market is extremely volatile and can fluctuate sharply. If market prices drop below the agreed upon price of a contract it is possible that an airline could pay more than the market price for fuel. If an airline is forced to pay for fuel at a high contracted price while other airlines are paying significantly lower spot prices the airline that hedged would be at a significant financial disadvantage.

However, airlines that do not hedge are taking the risk that fuel prices could increase and costs will rise. It can be argued that even with hedging fuel prices there is no way to truly mitigate risk. Sir Rod Edding was the CEO of British Airways from 2000 to 2005 and was against the practice of hedging against fuel prices.

A lot is said about hedging strategy, most of it is well wide of the mark. I don't think any sensible airline believes that by hedging it saves on its fuel bills. You just flatten out the bumps and remove the spikes. When you hedge all you do is all you do is bet against the experts of the oil market and pay the middle man, so you can't save yourself any money long term. You can run from high fuel prices briefly through hedging but you can't run for long.<sup>52</sup>

It is worth noting that Sir Rod Edding is no longer the CEO at British Airways and that he tried to pass along increased fuel cost to the consumer.<sup>53</sup> In air freight, firms such as Fed-Ex can pass along fuel costs to the consumer through the use of surcharges but in airline travel the reaction of the customer can be unpredictable and consumers may not purchase tickets if forced to pay large surcharges.

Another explanation for airlines not to utilize hedging strategies is because it requires a positive cash flow. Gerard Arpey, the CEO of American Airlines, the world's largest airline, stated that:

Regrettably, we moved away from our historic hedging program in mid-2003 because of our liquidity difficulties," Arpey said in an interview in

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<sup>52</sup> Cobb, Richard, Alex Wolf "Jet Fuel Hedging Strategies: Options Available to the Airlines and A Survey of Industry Practices." Northwestern University 391(2004 ): 17.

<sup>53</sup> "BA's fuel surcharge to increase." BBC News BBC.CO.UK08 Oct 2004 21 Sept 2007 <<http://news.bbc.co.uk/1/hi/business/3726424.stm>>.

Paris on Sunday. "To hedge you need cash or a balance sheet," he said. "And in the dark days of 2003, we didn't have either one. Today we're in a stronger position and we're hedging again, but you can't turn the clock back, so you're now hedging in the \$60 range.<sup>54</sup>

In recent years hedging has become less effective because as fuel contracts expire the new contracts have higher target prices. Airlines that are already in financial trouble have a hard time purchasing fuel contracts because the practice of hedging does require that firms have cash and or credit with which to purchase future fuel needs along with current needs.

Hedging is not a core competency of airlines. The business of airlines is transporting people and things from point to point. However, if one airline does mitigate its exposure to raises in the cost of fuel it could provide that airline with a competitive advantage over other airlines.

Hedging allows airlines to lessen the volatility and uncertainty of future fuel costs which can aid in planning the future financial decisions. Hedging does require funding in order to purchase the contracts and pay for transaction costs. Moreover, in order to hedge there has to be a party willing to take the risk of becoming counter-party in the deal.

### **C. HEDGING METHODS**

Although it is possible that a contract may result in a higher than market price, the airlines use a montage of hedging methods to mitigate their risk. These different financial instruments of a hedging strategy include different types of swaps, options, futures contracts, forwards contracts and collars strategy. The airlines use a mix of these instruments when hedging fuel prices.

A plain vanilla swap is arranged using the OTC market. The airline normally wants the fixed price in exchange for a floating price.<sup>55</sup> The two parties settle the contract by exchanging money. The money exchanged is the difference between the contracted price and the market price of the underlying asset at a set point in time. This contracted

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<sup>54</sup> "Airline group raises its 2006 loss forecast." [International Herald Tribune](#) 05 Jun 2006.

<sup>55</sup> Dave Carter, Dan Rogers, and Betty Simkins. "Fuel Hedging in the Airline Industry: The Case of Southwest Airlines."

swap can run on a monthly, quarterly or even annual basis.<sup>56</sup> This is also an off-balance sheet financial agreement because the contract involves no exchange of the underlying commodity, fuel.<sup>57</sup> What the airlines can gain from a plain vanilla swap is a mitigation of risk because if the price of fuel goes up they can take the incremental difference gained from the contract and use that funding to help pay for the high cost of fuel that the airline needs for operations.

A differential swap is based on the difference between two different commodities and their actual price difference over a set amount of time.<sup>58</sup> Airlines can use differential swaps to mitigate the exposure to basis risk of a swap. Basis risk is the risk that offsetting investments in a hedging strategy will not change price in equal and opposite directions from each other.<sup>59</sup> This could make for an imperfect correlation between the two investments. This can also create the potential for losses in a hedging strategy. A differential swap mitigates this risk by enabling the airlines to hedge against the imperfection of the swap.

Futures contracts let airlines purchase and sell a set amount of a commodity at a predetermined point in time. Airlines can utilize futures contracts to smooth the outflow of cash for fuel. A forward contract is only settled at maturity while a futures contract is re-priced on a daily basis. Airlines utilize forward contracts as a customizable financial instrument where airlines will hedge a percentage of fuel usage in each quarter. Airlines can use forward contracts to again mitigate their exposure to swings in commodity prices.

Southwest Airlines is one carrier that uses this technique. Southwest Airlines utilizes call options which is a right to buy a particular asset at a set fixed price at a time up until the contract hit its maturity date.<sup>60</sup> A call option caps the amount that an airline pays for fuel. Airlines commonly purchase heating oil options as a cross market hedge

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<sup>56</sup> Dave Carter, Dan Rogers, and Betty Simkins. "Fuel Hedging in the Airline Industry: The Case of Southwest Airlines."

<sup>57</sup> Ibid.

<sup>58</sup> Ibid.

<sup>59</sup> Kleinman, George. Trading Commodities and Financial Futures: A step by step Guide to Mastering the Market. 3rd. New York: Financial Times Prentice Hall, 2005.

<sup>60</sup> Dave Carter, Dan Rogers, and Betty Simkins. "Fuel Hedging in the Airline Industry: The Case of Southwest Airlines."

against a rise in the price of jet fuel because the two commodities are highly correlated.<sup>61</sup> Southwest Airlines likes the flexibility that call options provide but the options are expensive compared to other financial instruments because of the volatility of the energy market.<sup>62</sup> In order for a speculator to take the counter-party risk to the airline's call option the put option must have a large payoff.

Since the cost of option contracts are high many airlines use a collar which is a combination of a put option and a call option. A collar strategy can lock in a price range of a commodity for a set amount of time. If an airline buys a call option of \$2.00 per gallon and sells a put option at \$1.00 per gallon the airline will not pay more than \$2.00 a gallon nor will it pay less than \$1.00 a gallon for the life of the contracts. The benefit here is that if the price of fuel rises beyond \$2.00 the airline will be able to exercise its contracts and still pay less than competitors that purchase fuel at the spot price. The downside is if the price of jet fuel drops below \$1.00 the owners of collars could end up paying more than airlines that buy fuel at the spot price. The reason the airlines utilize collars is to mitigate risk.

Managing the placement of puts and calls for the airline is difficult. The airlines do not accomplish this internally but rather outsource such activities. Citigroup Corporate and investment banking services states that they have an expertise in the commodity market and developing structured hedging solutions.<sup>63</sup> Airlines which constitute some of Citibank's customers are able to take advantage of the services which enables them to tap into a worldwide network which enables the airlines a market to mitigate their fuel cost risks.

Southwest Airlines uses a variety of derivative instruments. Southwest Airlines utilizes both crude oil and heating oil based derivatives to mitigate its exposure to jet fuel

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<sup>61</sup> Dave Carter, Dan Rogers, and Betty Simkins. "Fuel Hedging in the Airline Industry: The Case of Southwest Airlines."

<sup>62</sup> Dave Carter,, Dan Rogers, and Betty Simkins. "Fuel Hedging in the Airline Industry: The Case of Southwest Airlines."

<sup>63</sup> James Barker. "Hedging the FX of Jet Fuel Exposure." Citigroup Corporate and Investment Banking. Client Presentation, New York. 31 Oct 2006 .



prices.<sup>64</sup> Other instruments are call options, collar structures and fixed price swaps.<sup>65</sup> As old contracts expire new contract are obtained so that Southwest can utilize a rolling hedging strategy. Hedging gains are recorded as reduction on the balance sheet credited to fuel and oil expense.<sup>66</sup> This is important because gains from hedging are reported as reductions in operations costs not as a straight forward gain from speculation therefore the amount of tax applied to the gain is less than if such speculation were not connected to an operating cost.

#### **D. FUTURE STRATEGY OF THE AIRLINE MARKETPLACE**

In order to stay competitive in the airline industry airlines will have to hedge against rising costs of fuel. Fuel costs in recent history have been going up and this cuts into the profit margin of airlines because of the increases in operations costs. Airlines that do utilize a hedging strategy have a short term competitive advantage over those airlines that do not have a hedging strategy. Southwest Airlines, which has an aggressive hedging strategy, has produced a profit while other major carriers that do not hedge have lost money. Hedging fuel prices has helped Southwest Airlines gain a competitive advantage by reducing costs. Yet if the price of fuel rapidly declines the competitive advantage that Southwest and other low cost carriers had due to hedging would turn into a competitive disadvantage because the fuel hedged airlines would be forced to pay higher than spot oil prices. Moreover, low cost carriers like Southwest Airlines and Jet Blue will have to continue to hedge against fuel costs as these cost rise because they are competing on the basis of price. If these low cost carriers can pay less then their competitors for fuel they can increase their profit. The larger legacy carriers will have to continue to become more aggressive in their hedging strategy if they too want to remain competitive if the cost of jet fuel continues to rise.

Conversely if the cost of fuel falls rapidly low cost carriers like Southwest Airlines may be subjected to paying higher than spot prices for fuel due to their contracts. If this were to happen heavily hedged airlines could be operating at a loss. In this case the

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<sup>64</sup> Dave Carter, Dan Rogers, and Betty Simkins. "Fuel Hedging in the Airline Industry: The Case of Southwest Airlines" <http://NewOrleans/Papers/8302208>, Retrieved 2 Mar 2007.

<sup>65</sup> Ibid.

<sup>66</sup> Ibid.

short term competitive advantage would be gained by the airlines that did not hedge their fuel costs and depending on the severity of the drop in oil prices hedged airlines could be at a competitive disadvantage for several years. However, hedging is not the only change that must be made in the airline industry.

It is important to note that hedging is not a long term solution to ward off rising fuel costs. Airlines in the future will be constantly trying to improve jet fuel efficiency.<sup>67</sup> Airplanes need fuel in order to run however; airlines can conserve fuel by reducing onboard weight. This can be accomplished by more accurately predicting weather patterns so that fuel consumption and fuel load can be lowered. An example of this is planning routs to maximize or minimize the effects of the jet-stream's flow which can either increase or decrease fuel efficiency depending on direction. Airlines have redesigned the hub and spoke method of airline travel so that longer, higher cruise times can be established, which utilize less gas than the takeoff and landing phases of flight.<sup>68</sup> Airlines may also participate in pooling methods so that the customers are shuttled between carriers to insure full loads on every trip. Airlines may employ a bulk buying strategy where the airlines join forces and procure fuel as a conglomerate to lower costs.<sup>69</sup> In the future airlines will also be using retrofit material to increase the fuel efficiency of their aircraft. For example, winglets, which can be added to an aircraft's wingtip, can significantly reduce drag and help to conserve fuel.<sup>70</sup>

The advent of new technology will be extremely important to the strategic future of airlines because more fuel efficient aircraft are being fabricated by the Boeing and Airbus aircraft manufacturing firms. The Boeing 787 which is scheduled to enter service in May of 2008 is partially made of composite materials that will significantly reduce its fuel consumption.<sup>71</sup>

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<sup>67</sup> ATA Public Reports. "Fuel 101: From Well to Wing." Air Transport Association of America 27 Apr 2007 : 1-3.

<sup>68</sup> Ibid.

<sup>69</sup> Ibid.

<sup>70</sup> Ibid.

<sup>71</sup> Elizabeth M. Gillespie. "Boeing To Lighten 787, Increase Fuel Efficiency." Manufacturing.Net 07 Nov 2006.

Airbus has decided to go a different way than Boeing as is developing a 500 seat super jumbo jet called the A380. The A380 can carry so many people that Airbus claims that the burn rate per seat will be reduced.<sup>72</sup>

#### **E. SUMMARY**

The airline industry has a very competitive landscape and the events of September 11<sup>th</sup> hurt the airline industry as a whole financially. Fuel cost comprises a large portion of airlines operating costs. Fuel hedging has become a method in which airlines try to make their operating costs more predictable.

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<sup>72</sup> "Airbus A380 Super Jumbo Twin-Deck, Twin-Aisle Airliner, Europe." [Aerospace-Technology.Com](http://www.aerospace-technology.com/projects/a380/) 22 Sept 2007. Aerospace Industry. 26 Sept 2007 <<http://www.aerospace-technology.com/projects/a380/>>.

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## **V. EXAMINING THE EFFECTIVENESS OF THE DOD IN THE FUTURES MARKET**

**Chapter Overview:** The purpose of this chapter is to explain what steps the DoD and the United States Government have taken in regard taken to hedge fuel prices. This chapter explains who the stakeholders would be if the DoD were to employ a hedging strategy and how well the DoD would fit within the hedging marketplace. The chapter will then outline the benefits and the drawbacks to the DoD entering the hedging marketplace and discuss the alternatives that the DoD is assessing to decrease their jet fuel usage.

### **A. DOD AND HEDGING HISTORY**

The Under Secretary of Defense (USD) tasked the Defense Business Board to examine ways in which the DoD exposure to fuel price volatility could be reduced.<sup>73</sup> This occurred in 2003 after the Office of Management and Budget (OMB) directed the DoD to consider fuel hedging.<sup>74</sup> The task group reported its findings to the USD in March of 2004.

The task group was made up of defense industry representatives, private sector oil industry representatives and representatives from various United States airlines.<sup>75</sup> The process the task group employed was to look at how the DoD procures fuel and compare and contrast how airlines procure fuel. The task group found that hedging was a vital part of how airlines operate. The task group summary recommendations were:

The Board's Task Group concluded that DoD could feasibly hedge its fuel purchases. In particular, the Department could design an effective hedging

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<sup>73</sup> Denis A. Bovin. United States. Defense Business Board. Report to the Senior Executive Council, Department of Defense Fuel Hedging Task Group Report FY03-8: Recommendations related to the practical use of fuel hedging for the department of Defense. Washington D.C.: DBB, 2004.

<sup>74</sup> Ibid.

<sup>75</sup> Ibid.

program that does not disrupt commercial markets. Though DoD is a large consumer of fuels, its consumption does not exceed that of a major airline by a significant amount.<sup>76</sup>

The task group concluded that there were two options: not to hedge or to institute a low-risk pilot program.<sup>77</sup> The OMB recommended the DoD engage in the pilot program but senior OMB analysts stated that the choice to implement the program is a DoD decision.<sup>78</sup> Hence the OMB was not going to take the responsibility of instituting a program and it was going to become another task that the DoD would have to undertake. The DoD retorted that the OMB should consider seeking legislative authority to engage in hedging by entering into an agreement with the Department of Interior's Mineral Management Services Group (MMS) to reduce the fuel price volatility.<sup>79</sup>

The MMS is a Federal Bureau, in the Department of the Interior, responsible for collecting, auditing and disbursing revenues from mineral leases on Federal and American Indian lands and natural resources on the federally-controlled outer continental shelf which extends from three miles off the coast of most states to about 200 miles at sea.<sup>80</sup> The MMS collect royalties from leases, rents and exploration bonuses from oil gas and other companies that utilize Federal sites.<sup>81</sup> The MMS distributes revenue to American Indians whose land is leases through the MMS, and to individual states whose land or water is leased through the MMS. In FY07 the MMS distributed \$1.9B in royalty

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<sup>76</sup> Denis A. Bovin. United States. Defense Business Board. Report to the Senior Executive Council, Department of Defense Fuel Hedging Task Group Report FY03-8: Recommendations related to the practical use of fuel hedging for the department of Defense. Washington D.C.: DBB, 2004.

<sup>77</sup> Ibid.

<sup>78</sup> Ibid

<sup>79</sup> Ibid.

<sup>80</sup> Patrick Cassidy. "Feds Ready Offshore Energy Rules." [www.capecodonline.com](http://www.capecodonline.com) 71108033408 NOV 2007 1-3. 12 JAN 2007 <<http://www.capecodonline.com/apps/pbcs.d11/article?AID>>.

<sup>81</sup> "MMS Collects and Distributes \$11 Billion in Revenues for FY 2007." MMS GOV Press. 2007. MMS.GOV. 13 Dec 2007 <<http://www.mms.gov/ooc/press/2007/press1203.htm>>.

receipts to thirty four states.<sup>82</sup> However, over 50% of the collected revenues or over \$5.5B is distributed to various Federal special-use accounts to include the General Fund of U.S. Treasury.<sup>83</sup>

The DoD was seeking an internal hedge because the MMS generates revenue each year by leasing off-shore energy resources and in recent history as fuel prices have risen sharply, the revenues of the MMS have grown. Conversely as fuel prices have risen the DoD's operation budget, partially due to increases in fuel prices, has risen. Essentially what the DoD recommended was a transfer of money from the MMS to the DoD due to changes in jet fuel prices.<sup>84</sup> The DoD felt that such a transfer could help to alleviate the problem of rising fuel costs without the DoD's entry into the commercial hedging marketplace.<sup>85</sup> At the conclusion of the task force no steps were taken for the DoD to enter the commercial hedging marketplace nor was an internal transfer of funds between the DoD and the MMS established. However, one point the task group failed to note was what price fuel must reach so that it would be feasible for the DoD to enter the commercial hedging market.

## **B. METHOD OF IMPLEMENTATION**

The one solid output from the task group was that if the DoD were to enter into a commercial hedging operation it would have to be the DoD that petitions Congress to do so. The OMB stated such during the debriefing of the task forces' findings.<sup>86</sup>

So the next step would be for the DoD to petition Congress to allow the DoD to set up a trading unit in the commercial hedging market or to outsource the activity. An organic method or setting up an autonomous unit that would run the hedging activity for the DoD would be costly and is outside the DoD's expertise.

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<sup>82</sup> "Thirty-four States Earn \$1.9 Billion in Royalty Receipts." MMS GOV Press. 2007. MMS.GOV. 4 Dec 2007 <<http://www.mms.gov/ooc/press/2007/press1204.htm>>.

<sup>83</sup> "MMS Collects and Distributes \$11 Billion in Revenues for FY 2007." MMS GOV Press. 2007. MMS.GOV. 13 Dec 2007 <<http://www.mms.gov/ooc/press/2007/press1203.htm>>.

<sup>84</sup> Denis A. Bovin United States. Defense Business Board. Report to the Senior Executive Council, Department of Defense Fuel Hedging Task Group Report FY03-8: Recommendations related to the practical use of fuel hedging for the Department of Defense. Washington D.C.: DBB, 2004.

<sup>85</sup> Ibid.

<sup>86</sup> Ibid.

However, an organic operation could help to provide the operational security that the DoD may need to successfully implement a hedging strategy.

Outsourcing or hiring trading specialist in the financial world to institute the options trading is a more feasible solution to the organic method because the hedging expertise is in the commercial environment not in the DoD. The outsourcing could be accomplished with a firm that operates within the market of futures and options trading. A contract would exist between the selected firm and the DoD to create a price incentive and return on investment so that a cost benefit could be realized for the contracted firm, the DoD, the federal government and the taxpayer.

### **C. STAKEHOLDER CONCERNS**

If the DoD were to enter the commercial fuel market many different agencies, people and nations would be affected; laws would have to be changed to allow the DoD to operate in the open market place and create a profit. Hence, OMB would have to petition Congress to pass regulation to allow the DoD to enter a commercial hedging market, and Congress would have to appropriate funds in order to establish hedging capability. OMB may not be inclined to support such a petition especially because in 2004 the OMB stated that the decision to enter the market would be the DoD's possibly because OMB does not want to accept the risk associated with recommending a hedging strategy. Congress may not be inclined to authorize the DoD to enter the marketplace because its representatives may not be too keen on how their constituents view the DoD in the commercial marketplace. Also DoD's procurement is limited to products and services. Laws would have to be passed that allow for the DoD to procure financial instruments. Additionally the DoD lacks the authority to retire gains from the purchase of a financial position so additional laws would have to be passed that allow for the DoD to garner the benefits after a position has been sold.

The Organization of the Petroleum Exporting Countries (OPEC) is an international Organization made up of eleven oil producing nations. OPEC may change pricing policy in an unfavorable way if the DoD enters the hedging market for oil procurement. There is no evidence to support this theory but it is viable in light of recent world events where the United States is not always considered a favored nation.



The DoD purchases more fuel than any single airline hence the Airline Industry: would have to compete with the DoD in the hedging market place. However this may have a positive influence on the airlines. Delta Airlines, American Airlines and United Airlines combined purchase more than twice as much jet fuel as the DoD.<sup>87</sup> So if the DoD entered the hedging market it would be just another customer that would increase the liquidity of the marketplace which could make the market more efficient.<sup>88</sup> Additionally the DoD is not concerned with profit like the airlines. The goal of the DoD in the hedging market would be to stabilize prices of fuel to decrease the cost of operations in a budget cycle if the cost of fuel continues to rise. Decreasing budget flux would be an end goal of the DoD and they would have shorter time horizon contracts than the commercial airlines so even though the DoD is the biggest single buyer of fuel it most probably would not be the biggest single hedger of fuel prices because they have a shorter time horizon.

The financial industry would be another stakeholder if the DoD decided to enter into the hedging market because they would have to take the DoD on as a customer. The DoD has consistently done business at a slower pace than the private commercial market and the meshing of the two communities may prove to be a problem. Additionally, a potential DoD problem may be who to choose to carry out the DoD's hedging strategy. This would be a substantial contract for any financial institution and the DoD must be very careful in its source selection

Individual oil production companies such as Shell, British Petroleum (BP), and Exxon Mobil will have a vested interest in the DoD's entry into the commercial hedging market because it could affect their stock prices. If the public sees a large consumer like the DoD getting a break on oil prices it could be construed as a weakness of the oil producing industry to maintain its customer base. This could prompt investors to sell their interest in major oil companies. Even though the DoD's entry in the commercial hedging market is not a sign of weakness of the oil industry the public response to news in erratic ways and this may have a negative affect on large oil companies stock prices.

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<sup>87</sup> Lawrence E Spinetta. "War Without Oil: Catalyst for Transformation Fuel Hedging: Lessons from the Airlines." Air Force Journal of Logistics XXX3(2006): 32-45.

<sup>88</sup> Ibid.

Other nations that are friendly or hostile towards the United States may have a fundamental problem with the DoD entering the commercial hedging market because of the appearance of possible political influence for economic gain. An entry into the commercial hedging market could be seen by some nations as an attempt to influence the market through the use of military power and congressionally appropriated funding.

In the past the American public has blamed individual firms when oil prices have spiked.<sup>89</sup> American voters may not like the idea of their tax dollars being utilized to hedge commodity prices. Voters could hold their representatives responsible for future oil price hikes especially if the American press spins a story that places the blame of increase fuel prices on the DoD's entry into the hedging market. Also if prices of fuel rapidly drop and the DoD ends up paying more than the spot price for fuel the American public could become enraged that their tax dollars were spent in a failed hedging pursuit.

The DoD Services would also be a stakeholder if the DoD were to implement a hedging strategy. The Air Force, utilizing over 50% of the fuel budget, would have to show large cost savings associated with fuel hedging. Even though the fuel budget is a small percentage of the overall DoD budget results will have to be shown and this may mean that the Air Force would have to give up some of its current funding in order to fund a pilot program for hedging. However, such an investment would be extremely viable for the Air Force as the largest DoD consumer of fuel. The OMB forecasted costs for fuel have been historically off the mark.<sup>90</sup> Having a stabilized cost for fuel will help the Air Force plan and execute its budget with more accuracy. This will hopefully eliminate the need for the large supplemental budget requests. The Navy and Army will also have to realize a cost savings and identify any logistical problems hedging might have. Since they are not as large a consumer of fuel as the Air Force, the Navy and Army and other DoD agencies may have less of a motivation to enter into a hedging strategy. Increased fuel costs is a universal DoD problem but if all the individual DoD agencies do not support a hedging program there may not be enough support to institute the program.

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<sup>89</sup> Nelson D. Schwartz "Who's to blame for high gas prices?" CNN Money 13 Apr 2006:

<sup>90</sup> Lawrence E. Spinetta. "War Without Oil: Catalyst for Transformation Fuel Hedging: Lessons from the Airlines." Air Force Journal of Logistics XXX3(2006): 32-45.

#### **D. MARKETPLACE ISSUES**

The DoD participating in a commercially acceptable practice such as hedging would not be totally unique. Mexico, Brazil and Chile utilize the oil derivative market.<sup>91</sup> The Thrift Savings Plan which functions as a DoD 401(k) is commercially managed by Barclays Global Investors. Government municipalities, transportation authorities and government sponsored power cooperatives utilize hedging strategies.<sup>92</sup> Fannie Mae, Ginnie Mae, and Freddie Mac are government sponsored entities which utilize hedges to manage risk.<sup>93</sup> The DoD is different from other government agencies but it does share these agencies' fiduciary duty to be responsible to the money that has been appropriated. Hedging fuel costs may be a method to better protect the tax payer dollar.

However it must be noted that the core mission of the DoD is not and will never be to hedge fuel prices; however the core mission of the airlines is not to hedge fuel prices either. Yet both the DoD and the airlines could utilize hedging as a tool to control cost. In order to establish a successful hedging strategy, the DoD would have to utilize the expertise of the private sector. Industry experts in the financial world, airline industry and oil industry must be leveraged.

#### **E. BENEFITS OF ENTRY**

The benefits of the DoD entering the commercial hedging marketplace are that the overall cost that the DoD pays for fuel could be stabilized. Another benefit is that the operational commands would not have to curtail operations due to constrained resources of fuel due to the high prices. Hedging fuel rising fuel prices could also help to create a stable, predictable budget outlay. This would help the DoD project their budget with more accuracy and improve the management of federal funds. If the DoD were better able to predict their cash flow and operating costs, supplemental appropriations possibly could be lessened and this would enable the DoD to invest in under-funded programs.

Beyond predictability hedging helps to stabilize the process of cash flow. DoD programs must operate in a unique environment governed by DoD directives, Federal

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<sup>91</sup> Lawrence E. Spinetta. "War Without Oil: Catalyst for Transformation Fuel Hedging: Lessons from the Airlines." Air Force Journal of Logistics XXX3(2006): 32-45.

<sup>92</sup> Ibid.

<sup>93</sup> Ibid.

laws, regulations and policies along with Defense Acquisition policies that influence funding profiles for programs. The derived funding profiles along with technological hurdles and management of people and resources dictate program schedules. When funding is pulled from a program in order to pay for current year fuel costs the aforementioned program endures a cost of delay.<sup>94</sup> The cost of delay of funding contributes to schedule slips, wasted effort, loss of manpower, scheduled equipment and missed opportunities to advance the program.

The programs in the DoD must base their schedule on moving budget targets because of unpredictable cash flow. The increase in fuel prices has contributed to the cash flow problems of the DoD. If the DoD programs have strong predictable cash flow tied to a realistic schedule the program will have a greater likelihood of success.<sup>95</sup> However, once the resources are removed from a program it is extremely hard to maintain the original schedule. The DoD can not continue to cut funding of future programs in order to pay for current year fuel bills.

## **F. DRAWBACKS OF ENTRY**

The major drawback to implementing a strategic fuel hedging strategy is that it might not work. If the price of fuel does go down dramatically the DoD could end up paying more than they would have if they procured fuel at the spot price because the DoD would have contracted to do so. Also if a hedging strategy is not implemented correctly the result could be that the DoD pays more for fuel than they should. Hedging involves the mitigation of risk and the use of leverage. If the financial institution that does the DoD bidding does not do so correctly then tax payer dollars could be lost.

The DoD does not have the internal knowledge to create a financial arm that could compete with the stabled commercial market. The DoD does not have the experience in this area nor is hedging in the DoD's core competency. So one could make the argument that since hedging is not a core competency then it should not be done. Moreover, the DoD is a captive market the operations tempo can change quickly and the

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<sup>94</sup> Richard L. Coleman, Summerville, Damerson, "The Relationship Between Cost Growth and Schedule Growth" Acquisition Review Quarterly 13 Apr 2003.

<sup>95</sup> Ibid.

need for fuel can be reduced. If the operations tempo dropped radically there would be less money to be saved via hedging and the upfront costs of setting up a hedging strategy would be hard to recover.

The DoD also has to be clandestine in its pursuit for commodities. The DoD must practice good operational security. Jet fuel futures may be a tip to the enemy about the United States Military future operational tempo.

Another major drawback is that in order to have a successful hedging strategy capital is needed in order to procure the contracts. The DoD is in a cash-strapped position and hedging would require additional funding that would take away support for other programs.

Another drawback is the political obstacles of implementing a hedging strategy. Laws must be passed in order for the DoD to market itself in the commercial futures market. Passing these laws will take a lot of time and energy from the members that might be better used on some other initiatives. Also it appears that no one agency is willing to take the political risk needed to institute a hedging program for the DoD. For representatives it is not a great political move to champion a hedging program for the DoD because it has a lot of risks associated with it whether it fails or succeeds.

Public sentiment is another drawback to the DoD entering the hedging market. GWOT and other U.S. military operations have garnered the attention of the world. If the DoD were to enter the commercial hedging market there could be a negative public response that would cost the DoD more than it could ever save through the use of hedging.

## **G. ALTERNATIVE SOLUTIONS**

Hedging fuel prices is not the only solution that the DoD should be looking at to solve its high fuel price problem. The U.S. as a nation is a large consumer of fossil fuels and alternate means of energy must be developed to help alleviate the DoD's dependence on fossil fuels. Additionally we have seen alternate oil extraction methods such as the natural gas transformation and oil sands procurement evolve recently as the price for oil has made these energy options more viable. Hedging provides a financial solution to the budgeting problem but it does not address the overall core need of the DoD as an energy

consumer. If the DoD starts to utilize other methods of energy the need to enter the futures market might decrease because the political drawback could outweigh the cost savings potential.

For example, the Department of Energy has teamed with the DoD in the establishment of research into green fuels. If aggressive steps are made and the DoD's dependence on fossil fuels is drastically reduced there may be no need for the DoD to trade on the futures market.

Coal-to-Liquid Fuels is another way in which the DoD could reduce its reliance on fossil fuel. The United States has a very large reserve of coal. According to the National Mining Association the U.S. has over 500 billion tons of coal which is enough to satisfy a growing coal demand for over 200 years.<sup>96</sup> However coal extraction and transformation to liquid form is costly. Moreover, establishing the infrastructure to perform the coal-to-jet-fuel transformation is costly.<sup>97</sup> The Air Force is already involved in a series of tests of synthetic fuels. A B-52 from the 5<sup>th</sup> Bomb Wing at Minot Air Force Base, N.D. performed test flights with its reconfigured engines running on mixtures of synthetic fuel.<sup>98</sup> The flight that utilized a mixture of synthetic fuels and jet fuel was deemed successful and further cold weather testing has been scheduled.<sup>99</sup>

Providing the capital to initiatives like coal-to-liquid fuels may prove to be a better investment in the long term than utilizing the futures market because of the technological advancements in energy extractions.

Fuel Cells could also reduce the DoD's reliance on fossil fuels. The DoD is also involved in the procurement and development of fuel cells. Fuel cells are advantageous due their short logistical constraints. Fuel use is characterized by large multipliers and factors because it takes fuel to deliver fuel.<sup>100</sup>

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<sup>96</sup> Russell Wicke. (September, 12, 2006). Rising Fuel Costs Tighten Air Force Belt. *Military.com*, 15240, Retrieved March 13, 2007, from [www.military.com](http://www.military.com)

<sup>97</sup> Ibid.

<sup>98</sup> Wicke, Russell (September, 12, 2006). Rising Fuel Costs Tighten Air Force Belt. *Military.com*, 15240, Retrieved March 13, 2007, from [www.military.com](http://www.military.com)

<sup>99</sup> Ibid.

<sup>100</sup> Paul Dimotakis, Nathan Lewis, and Robert Grober. "Reducing DoD fossil-fuel dependence." *Energy Bulletin* 23097(2006): 1-7.

Currently the DoD is using a lot of fuel to deliver fuel, via tanker refueling, Aircraft carriers and fuel mobility vehicles. Fuel cells and their demand on the open market may make hedging the oil futures market a futile task.

## **H. SUMMARY**

In this chapter we have discussed the steps that the DoD and the United States government has made in regard to fuel hedging and what conclusions that senior leaders have drawn from investigation commercial practices. We have addressed the stakeholders if the DoD were to institutes a hedging strategy. We also conveyed the benefits and the drawbacks to the DoD entering the commercial hedging marketplace. The chapter closed with a discussion of the current alternatives to hedging that the DoD is looking to the decrease their jet fuel usage.

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## **VI. CONCLUSIONS**

Although hedging has proved successful in the short run for the commercial airlines the DoD should not enter the commercial hedging market to help mitigate the DoD's exposure to higher fuel prices. If laws were passed and political support was given to a pilot hedging strategy the DoD might be successful in limiting its exposure to swings in the price of fuel. The DoD could enter the market and not cause a disruption due to its volume but might be disruptive because the DoD is a government entity. Also as a government and military entity engaging in a commercial market hedging strategy may compromise operational security.

The DoD also does not have the resources to implement a hedging strategy. Such an endeavor would have to be outsourced and capital would be needed in order to fund the project. The DoD is running at a deficit currently and has repeatedly needed supplemental funding to continue operations. Hence funding could be better placed on other requirements instead of outsourcing a pilot program for fuel hedging.

The public may perceive the DoD use of derivate investing as a risky endeavor and this could tarnish the reputation of the DoD. The support of the public is extremely helpful to the DoD. Losing public support in order to hedge fuel costs is not a comparable tradeoff.

There is also inherent risk when dealing with hedging strategy. The DoD could lose money in the short term if the futures market changes rapidly. In the long term if the DoD established itself with a formidable hedging strategy they would most probably realize a cost savings. However, the potential cost savings at this point in time do not outweigh the political drawbacks of the DoD's entrance into the futures market.

Politically it does not make sense for a representative to support a DoD hedging strategy. The reason is that the stakeholder base would have too much to lose and would not be inclined to support such an endeavor. Politically elected officials need to be prudent with their involvement with tax payer dollars. Derivative trading is currently viewed as a risky behavior. Once the public perception of derivative trading changes so

that people do not view it as a risky endeavor but rather a risk mitigation tool the political risks of supporting a hedging strategy may be lessened.

Technological solutions and breakthroughs such as synthetic fuels could also lower fuel costs that make commercial hedging un-profitable. It is much less risky for a politician to support alternative fuel research than a financial hedging endeavor.

## VII. SUGGESTIONS

The DoD should not hedge in the commercial market but the OMB should seek legislative authority to engage in non-market hedging by making an intergovernmental arrangement with the DoD and the Department of the Interior's MMS group. One large benefit of this arrangement is that the DoD does not have to take a politically charged risk by entering the commercial market. Thus the threat of opposing public opinion is thwarted because it is an internal hedge. The DoD also does not expose itself to commercial risk within the derivatives market. The oil market is cyclical and the DoD could end up on the wrong side of a trade and pay more than the spot price for oil but with an internal hedge this risk is mitigated. Another benefit is that the floatation costs and the costs of outsourcing a commercial hedging outlet could be avoided. A downside to this internal hedge is that certain government agencies that have earmarked themselves as beneficiaries of the revenue generated by the MMS may have to share future revenues with the DoD. Royalties from oil and gas exploration are the government's second largest source of revenue, behind income tax.<sup>101</sup> The MMS is a large revenue generator and individual state representatives may not want the DoD to utilize funds generated by the MMS.

The MMS generated over \$11B in FY07 in revenue through its energy resources.<sup>102</sup> In FY07 the MMS collected a record setting \$4.4B in oil royalty revenue from the sale of over 584M barrels of oil. This volume is significantly higher than the 144M barrels of oil utilized by the DoD on an annual basis.<sup>103</sup> The MMS royalties are calculated by taking the production volume and multiplying it by the royalty rate which is 12% for land based extraction and 16% for offshore production.<sup>104</sup> Hence, there is a correlation between the MMS's revenue generation and the DoD's funding requirements

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<sup>101</sup> "Crude Awakening" PBS:NOW. 16 JUN 2006. Public Broadcasting Station . 13 Dec 2007 <<http://www.pbs.org/now/shows/224/index.html>>.

<sup>102</sup> "MMS Collects and Distributes \$11 Billion in Revenues for FY 2007." MMS GOV Press. 2007. MMS.GOV. 13 Dec 2007 <<http://www.mms.gov/ooc/press/2007/press1203.htm>>.

<sup>103</sup> Air Force Studies Board, (2006). A Review of the United States Air Force and Department of Defense Aerospace and Propulsion Needs. Washington D.C.: The National Academies Press.

<sup>104</sup> MMS home page.

to changes in fuel prices. If the price of oil continues to rise the MMS has the capability to fund the DoD's shortfall due to increased oil prices.

Conversely if the price of fuel drops the MMS collects less revenue off of its leases but the DoD would be paying less on the open market for fuel. In such a case the DoD would transfer funds back to the MMS to cover less than expected revenue generation. In the past when oil prices were low the MMS implemented a royalty relief program under the Deep Water Royalty Relief Act of 1995 which gave oil companies relief from paying funds due on their lease of drilling rights granted by the MMS.<sup>105</sup> Relief of royalties cut the profits for the MMS and if oil prices drop in the future the MMS may need an infusion of funds from the DoD.

The OMB could manage the internal hedge and the exchange of capital between the two agencies and the public market will not need to be involved. Hence there would be a reduction in the amount that the DoD seeks in supplemental funding and the negative impacts to the OMB's forecasts, DoD funding profiles and program schedules could be minimized in the short run. In the long term the MMS could receive funding from a transfer of funds from the DoD when oil prices go down.

However, the internal hedge is also just a short term solution. The price of oil will continue to fluctuate up and down in the future. The internal hedge would only help the DoD alleviate its cash flow problems generated by the recent increase in fuel prices.

The long term solution is the DoD should pursue its alternative energy projects. Using capital on research and development could yield a technological solution that is far superior to the financial solution of hedging fuel prices. The Air Force's use of synthetic fuels may prove to be incredibly profitable especially if it could be adapted to the civilian market place to include the airlines. Such an endeavor would be beneficial to both the DoD and the civilian market because with a higher volume more strategically placed supply lines could be established to provide synthetic fuel to more customers at a lower cost.

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<sup>105</sup> "Deep Water Royalty Relief Regulations ." U.S. Department of the Interior Minerals Management Service Office of Communication: News Release. 15 JAN 1998 . U.S. Department of the Interior. 14 Dec 2007 <<http://www.mms.gov/ooc/press/1998/80002.htm>>.

The non-market hedging relationship between the MMS and the DoD could aid in the development of alternative fuel solutions. The most promising alternative fuel solution is the coal to liquid synthetic fuel because the United States has large domestic coal resources and the synthetic fuel has been tested on legacy systems such as the Air Force's B 52 bomber. The MMS controls the leases to federally owned coal, oil and natural gas resources. In order to increase the viability of the coal to liquid transformation on the commercial market the MMS could provide financial incentives for coal mining and coal-to-liquid transformation simply by decreasing its royalty rate for coal exploration. This would increase the commercial viability of the process and provide the military with a cheaper alternative fuel that has been proven to work on some legacy weapon systems.

The DoD will always have a large energy need. In the future as legacy inefficient systems are retired and new fuel efficient and alternative energy systems are introduced the DoD's dependency on oil will decrease. Hedging either internally or on the commercial market is only a short term solution. An internal hedge between the DoD and the MMS would provide a short term solution to the DoD's problem and establish a long term mutually beneficial relationship between the two different government agencies.

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